Massachusetts Stormwater Management Policy/Regulations: Development, Implementation, and Refinement

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Abstract

In March of 1996, the Massachusetts Department of Environmental Protection, in conjunction with the Massachusetts Office of Coastal Zone Management, released the Draft Version of the State's Stormwater Management Policy. The Policy includes nine specific Stormwater Performance Standards, which are to be met to achieve compliance. The Policy presented in two volumes: Volume One, the *Stormwater Policy Handbook,* which contains a description of the policy, its implementation, and descriptions of the nine individual stormwater management standards, and Volume Two, the *Stormwater Technical Handbook,* which contains more detailed information on Best Management Practices (BMPs), for stormwater management (i.e., detention basins, swales, etc.).

The policy is the result of three years of work by a Stormwater Advisory Committee that included representatives from regulatory offices (EPA, Department of Fisheries and Wildlife, Natural Resources Conservation Service, etc.), engineers and developers from the private sector, the highway department, and representatives of local conservation commissions. The Policy is to be implemented as an amendment to the existing Massachusetts Wetlands Protection Act, which is administered at the local level by local Conservation Commissions.

The nine performance standards are the key components of the policy. General descriptions of the standards include the following:

1. No new stormwater conveyances may discharge untreated stormwater directly to, or cause erosion in wetlands or waters of the Commonwealth.
2. Post-development peak discharge rates may not exceed pre-development rates.
3. Maximize recharge to groundwater: post-development must be similar to pre-development conditions.
4. Remove 80% of average annual load-post development of Total Suspended Solids (TSS).
5. Use specific BMPs for discharges from areas with higher potential pollutant loads; untreated infiltration prohibited.
6. Use specific BMPs for discharges to critical areas.
7. Redevelopment projects should not meet performance standards to the maximum extent practicable and at a minimum, improve existing conditions.
8. Erosion and sedimentation controls are required during construction.
9. Operation and Maintenance Plan for Stormwater Management required.

The Policy was introduced in March of 1996 for testing its effectiveness. Two Phases of training were provided over a two-year period across the state. The first phase focused on introducing the Policy and the second phase focused on detailed Engineering Companies, and local DPWs and planning departments.

Introduction

In March of 1997, the Massachusetts Department of Environmental Protection (MADEP), in conjunction with the Massachusetts Office of Coastal Zone Management (CZM), released a draft version of the state's Stormwater Management Policy (herein referred to as the "Policy"). Prior to the development of this policy, the control of peak stormwater discharges from development sites to prevent flooding and erosion problems was a fairly standard requirement across the country; and was well-implemented in Massachusetts. However, there were no state-level requirements for stormwater quality treatment, maintaining groundwater recharge processes, or maintaining stormwater treatment systems. The Policy was developed to provide standard minimum requirements for stormwater management that could be consistently implemented on development projects.

The Stormwater Management Policy is currently an amendment to the Wetlands Protection Act which is only applicable when a project proposes work within the boundary, or buffer zone, of a Wetland Resource Area. Hence, the Policy is not applicable to all developmental projects.

While the regulatory implementation of the Policy is through local Conservation Commissions, under the State's Wetlands Protection *Act,* the performance standards and design guidelines that define the Policy were developed for use by a larger audience. Development teams (typically the proponent and their engineers, architects, and planners) and the various reviewing agencies (Conservation Commissions, Planning Boards, DPWs, etc.) were expected to be users of the Policy. The goal was to provide guidance to ensure that negative impacts from stormwater runoff generated as a result of urban and suburban development would be minimized without placing an unjustifiable economic burden on developers for new projects, or preventing redevelopment of existing sites.

The Policy includes nine specific Stormwater Performance Standards for which compliance must be achieved on development projects. Included in these standards is a requirement to provide groundwater recharge, requirements for ensuring proper stormwater treatment prior to discharge to waters of the state, and provisions for waiving certain requirements if deemed infeasible for redevelopment projects. The Policy has been distributed as an Interim Draft to allow for refinements prior to its final promulgation as state regulations. In order to fully gage its effectiveness, however, the Interim Policy has been distributed and implemented as if the regulations were final.

The Policy is presented in two handbooks: Volumes One and Two. Volume One, the *Stormwater Policy Handbook,* contains a description of the policy, its implementation, and detailed definitions of the nine individual stormwater management standards. Volume Two, the *Stormwater Technical Handbook,* contains detailed information on Best Management Practices (BMPs), with guidelines for the design of standard stormwater management structures (such as detention basins and water quality swales).

Development

The Policy is a result of three years of work by a State Stormwater Advisory Committee. In addition to leaders from MADEP and CZM, this Committee included representatives from such regulatory offices as USEPA, Department of Fisheries and Wildlife, and the Natural Resources Conservation Service. Also on the committee were engineers and developers from the private sector (including the author) and representatives from the Massachusetts Highway Department and local Conservation Commissions.

The goal of the Committee was to provide a cohesive set of performance standards that addressed key issues associated with stormwater runoff control. The Policy was developed in such a manner that it provides adequate accompanying guidelines and recommendations, to allow for consistent implementation, while still allowing for flexibility in site-specific designs. Given the widely varying goals and perspectives of Committee members, the Policy published in 1997 was a result of group consensus and compromise.

The Committee was divided into two sub-committees, the Policy group, and the Technical sub-committee. The Policy group was tasked with developing the process for legal implementation and the Technical Committee was responsible for developing the specific technical requirements of the Stormwater Management Policy.

Some of the performance standards introduced completely new requirements for development projects and required detailed evaluation and discussion during the development stages. Some of the key issues that generated substantial debate include the following:

- ***Recharge:*** The loss of recharge to groundwater systems, which provide drinking water supplies and generate baseflow to streams and rivers, was a state-wide problem. A mechanism for requiring the maintenance of recharge after development was considered a high priority. The biggest issue relative to this requirement was: How much annual recharge should be required?

- ***Water Quality Treatment Volume:*** The quality and quantity of stormwater runoff from paved and unpaved areas can vary greatly. It was determined by the Committee that runoff from impervious areas was the highest concern and should require treatment. The largest decision relative to this concern was: What volume of stormwater runoff should be treated for water quality? Should it include runoff from both pervious and impervious areas?

- Critical [illegible] The Committee felt that certain sensitive environmental areas should have the maximum practicable protection. Under the Massachusetts Stormwater Management Policy, "Critical areas" are defined as; shellfish growing areas, public swimming beaches, cold water fisheries, recharge areas for public water supplies and designated Outstanding Resource Waters (ORWs). ORWs are further defined to include surface drinking water supplies, certified vernal pools, and state designated Areas of Critical Environmental Concern (ACECs). The issue here was how to ensure that these areas are provided adequate protection and how to define what adequate protection is.

- ***Exemptions:*** Some Committee members expressed concern that stormwater management requirements may be too costly for small residential projects, or may be a deterrent for initiating redevelopment projects. The issue was what, if any, projects should be exempt from any or all of the standards?

- ***Operation/Maintenance:*** Maintenance of stormwater management practices is critical for their effectiveness. It is often difficult, if not impossible, to ensure that the operation and maintenance of BMPs will occur as necessary. The issue was: How can the necessary maintenance of BMPs implemented on the project be ensured?

A brief summary of the decisions on these key issues is as follows:

- ***Recharge:*** Annual recharge processes are permanently changed by the introduction of impervious areas to a site. In order to minimize this impact, it was agreed that the existing annual recharge should be determined and post-development annual recharge should maintain this to the maximum extent practicable. A preliminary methodology for determining existing recharge on the site was provided in the Draft Policy.

- Water Quality Treatment Volume:

  - For discharges to critical environmental areas (defined in the Policy), the volume of stormwater runoff to be treated for water quality control is defined as 1 .O inch of runoff times the total impervious area of the post-development project site.

  - For all other discharges, the volume to be treated is calculated as 0.5 inches of runoff times the total impervious area of the post-development project site.

  These volumes represent total runoff from the smaller, more frequent storms that occur annually, and the initial volumes of runoff from larger more infrequent storm events. The goal behind this decision was to fully treat the runoff from the majority of the storm events occurring annually, without approaching values where treatment system sizes would result in increasing costs with decreasing additional benefit.

  - ***Critical Areas:*** It was decided, as stated above, that 1 .O inch of runoff (as opposed to 0.5 inch) must be treated for water quality if the discharge is to a Critical Resource Area. Also, specific approved BMPs are recommended for use in particular critical areas. In addition, it was decided that spill prevention/containment methods must be included in the Stormwater Management System design.

- Specific cases were provided exemption from the Policy, including: single family house projects, residential subdivisions with four or fewer lots that do not discharge to critical areas, and emergency repairs to highway/roadways or their drainage systems. However, none of these projects are exempt from the standard requiring sedimentation and erosion control requirements during construction activities.

  While redevelopment projects are not exempt, a redevelopment project may comply to the maximum extent possible if it can be proven that it is not practicable for the project to achieve full compliance.

- ***Operation/Maintenance:*** All non-exempt projects require the development of a Stormwater Management System Operation and Maintenance Plan (O&M Plan). As defined in the Policy, the O&M Plan must contain the: names of the Stormwater Management System(s) owner and the person(s) responsible for implementing the O&M Plan, a schedule for inspection and maintenance, and a description of maintenance activities to be performed. Recommendations for specific maintenance practices and schedules are included in the Policy.

Stormwater Performance Standards

The nine Stormwater Performance Standards most accurately describe the key components of the policy that came out of the committee deliberations following resolution of the issues described above. The goal of the standards is to protect groundwater, surface water, and wetland resources from the impacts of stormwater runoff generated as a result of development and redevelopment projects. General descriptions of the standards are provided as follows:

1. No new stormwater conveyances may discharge untreated stormwater directly to, or cause erosion in wetlands or waters of the Commonwealth.

2. Post-development peak discharge rates must not exceed predevelopment conditions for the 2-year and 1 O-year storm events under all conditions. The 100-year event must be analyzed to determine impacts and must be controlled if necessary.

3. Loss of annual recharge to groundwater should be minimized through the use of infiltration measures, to the maximum extent practicable. The recharge “requirement” which is to mimic existing annual recharge on sites to the maximum extent practical, has not been changed. However, a design methodology for estimating existing annual recharge at a site, and for designing recharge systems has been developed. The methodology uses soil classifications, soil gradation analyses and specific Massachusetts regional rainfall data as data inputs.

4. Stormwater management systems must be designed to remove 80% of the average annual (post development) load of total suspended solids (TSS). It is presumed that this standard is met when; (a) suitable nonstructural practices for source control and pollution prevention are implemented; (b) stormwater management BMPs are sized to capture the prescribed runoff volume; and (c) stormwater management BMPs are maintained and designed as specified in Volume Two. The Policy provides estimates of the percent TSS removal for individual BMPs when designed in accordance with the specified guidelines. Water quality treatment volume is 0.5 inches of runoff from impervious areas (1 .O inch if discharge is to critical environmental area).

5. Stormwater discharges from areas that are defined as having “higher potential pollutant loads” (as defined in the Policy) require specific stormwater BMPs. Infiltration of stormwater from these areas without pretreatment is prohibited.

6. Specific BMPs must be used for discharges to critical areas and the water quality treatment volume is 1 .O inch of runoff.

7. Redevelopment projects must meet the performance standards to the maximum extent practicable. It must be clearly stated why full compliance cannot be achieved and such projects must, at a minimum, improve existing conditions.

8. Erosion and sedimentation controls are required during construction.

9. An Operation and Maintenance Plan (O&M Plan) for Stormwater Management is required.

A detailed explanation of each of these Standards is available in Volume One, the Stormwater Policy Handbook.

Implementation

In order to test its effectiveness and identify potential problems, the Policy was introduced in March of 1997, prior to the promulgation of regulations. Copies of Volumes One and Two were distributed to each Conservation Commission office in the state, and to other relevant regulatory agencies. Two phases of training were provided across the state over a two-year period: first to introduce the Policy, and then to focus on detailed case studies and implementation issues. Training was made available to regulatory agencies, Conservation Commissions, local DPWs, planning departments, and engineering companies. During the training sessions, the largest turnout was from Conservation Commission representatives and engineering/consulting firms, with minimal attendance by the other groups invited.

At each of the training sessions, questions from the audience on the Policy were solicited and a list of most Frequently Asked Questions (FAQs) was developed. The FAQs provided an excellent basis for outlining where additional information and/or clarification was needed. Based on the number of recurring questions, the Committee decided to prepare a survey to solicit feedback from potential policy users. The survey was comprised of 23 questions for characterizing the respondent, determining the usefulness and ease of implementation of the Policy, identifying particular problems in understanding or implementing performance standards, and determining what type of BMPs were currently being implemented.

The survey was not designed to be a statistically valid data set, but rather to gain a practical working knowledge of what aspects of the Policy and/or its method of implementation needed to be refined. While this was generally evident from the FAQs, the survey further substantiated the specific areas where additional work was necessary. Some key findings from the 118 respondents to the survey were as follows:

- The overall sense of the Stormwater Performance Standards was that the Stormwater Policy implementation was good (63%) and that they consider the Stormwater Handbook to be a “useful resource for designing and reviewing systems (77%).
- In response to the standards, respondents were generally comfortable implementing peak discharge controls and sedimentation and erosion controls. This was not surprising since these were existing requirements in most municipalities that needed to be achieved for most development projects.
- Not surprisingly, new requirements for groundwater discharge, treatment of stormwater runoff water, and the preparation of stormwater Management O&M Plans were the standards for which additional clarification and technical support were most requested.

Feedback

The Draft Policy was issued prior to formal promulgation so that one to two years of interim implementation could be used for refinement. The FAQs, user survey, and ongoing feedback from the public defined those areas where refinements were especially necessary, including the following:

Standard No. 3 ***Recharge:*** The recharge requirement clearly created the most confusion, and required additional technical support. The original brief description included in Volume One was not suff icient for engineers or reviewers to prepare a comprehensive program for achieving the annual recharge requirement.

As a result, the technical sub-committee has focused on providing a more detailed definition of the recharge requirement and appointed a group to develop a design methodology for achieving compliance with this standard. The group has developed a methodology using soil groups and soils analysis and actual rainfall data to determine the existing annual recharge on project sites. Methodology for designing a recharge system to provide post-development recharge that best mimics pre-development

conditions is being developed. This technical is currently in the final stages of development and is expected to be completed and distributed prior to December 1999.

Standard 4 - 80% TSS ***Removal:*** The Total Suspended Solids (TSS) removal requirement was not developed with the goal of removing only the TSS loads in stormwater runoff. Rather, it was considered an indicator parameter, whereby if 80% of the TSS is removed, a large portion of the additional pollutants carried in stormwater is also removed. This relationship does not hold true, however, if the proponent chooses to use only mechanical methods where settling of fines, assimilation of nutrients, or other biological processes that increase pollutant removal do not occur. For instance, a vegetated infiltrating swale, or wet pond, that is designed to provide substantial stormwatervelocity reductions may greatly increase fine sediment removal and may also provide nutrient uptake in addition to gross TSS removal. Astructure that removes solids only, and does not allow for detention or contact with plants or potential filtering areas does not comply with the goal/intent of the TSS removal standard.

In addition, users were having difficulty calculating TSS removals when numerous BMPs were to be used in a series. The specific percent removal rates provided in Volume One of the Policy are not additive and, as such, must be calculated as percents of the pollutant load that they receive.

In response to these issues, further definition of the goal of the TSS removal requirement and recommended practices for achieving the goal are being developed. A spreadsheet has been developed, which can be easily filled out by hand, to assist in calculating the percent TSS removal for a project based on the BMPs implemented.

Standard 9 - Operation and Maintenance: This standard has consistently raised the most concern relative to cost and implementation. Common questions were as follows:

- Who will pay for ongoing operation and maintenance of stormwater BMPs if it is not the town?
- How will the town fund the O&M requirements if they assume responsibility?
- . What long-term mechanism is there to ensure that maintenance will be completed?
- What is the frequency of maintenance required for specific BMPs?

While these questions are difficult to answer, for a specific site or on a statewide basis, in terms of required maintenance, the Committee has responded by preparing operation and maintenance checklists, which may be used by the operator/owner. These checklists may be submitted to the local Conservation Commissions on an annual basis, if deemed necessary.

Specific maintenance practices and suggested frequencies have also been prepared and are currently being updated, as new information becomes available. It has also been noted that "one size does not fit all" in terms of required maintenance. For instance, an infrequently used residential guest parking area clearly does not warrant the same frequency of street sweeping as a commercial mall parking lot.

The question of financing stormwater management system operation and maintenance activities is also a site- and location-specific issue. The development of stormwater utilities and management districts is ever increasing and may be the option that some communities choose. The promulgation of the Policy as regulations will require the project proponent and/or towns and municipalities to develop a plan for ensuring O&M implementation. There are a variety of ways this may be achieved. Resolution may be somewhat facilitated in larger municipalities and/or USEPA-designated urban areas that must comply with the upcoming final USEPA NPDES Phase II Stormwater Regulations.

Summary

The development of the Massachusetts Stormwater Policy, which includes nine performance standards, was an integrated effort between state and local regulators, policy makers, engineers, developers, and the general public. The group effort and the implementation of the Policy as a Draft, to which refinements could and have been made, have contributed to the usefulness of the standards. While the development and implementation of the standards are still in the early stages, the Policy provides definitive goals for achieving stormwater water quality and quantity control, and addresses annual recharge on

development sites. Until the development of these standards, there was no requirement to maximize groundwater recharge on sites or to mandate the development of the stormwater O&M Plan (unless required under other regulatory programs). These advances will provide an overall benefit to the natural resources of the Commonwealth of Massachusetts. The Stormwater Management Policy Volumes I and II may be obtained off the Internet or by request from:

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References

Massachusetts Coastal Zone Management, Massachusetts Department of Environmental Protection, Stormwater Management Volume One: Stormwater Policy Handbook, March 1997.

Massachusetts Coastal Zone Management, Massachusetts Department of Environmental Protection, Storrnwater Management Volume Two: Stormwater Technical Handbook, March 1997.

Massachusetts Coastal Zone Management, Massachusetts Department of Environmental Protection, The *Stormwater Evaluation Survey: Perspectives on the Implementation of the Interim Massachusetts Stormwater Policy,* June 1988.